C1 cancelled.

a cylindrical fixed surface surrounding the rotary member, wherein the fixed surface is spaced from the rotary member by a predetermined distance, and wherein the materials of the rotary member and the fixed surface are selected so that the material of the rotary member has a coefficient of thermal expansion that is smaller than that of the material of the fixed surface; and

armature coils arranged about a peripheral surface of the fixed surface to rotate the rotary shaft.

C2

9. (Three Times Amended) A motor provided in a turbo-molecular pump, comprising:

a rotary shaft; and

a bearing for radially supporting the rotary shaft, wherein the bearing includes:

a cylindrical rotary member connected to the rotary shaft;

a cylindrical fixed surface surrounding the rotary member, wherein the fixed surface is spaced from the rotary member by a predetermined distance, and wherein the rotary member is made of a material having a coefficient of thermal expansion that is $5x10^{-6}/°C$ or less; and

armature coils arranged about a peripheral surface of the fixed surface to rotate the rotary shaft.

C3

28. (New) A method for producing a brushless motor of a turbo-molecular pump having a rotary shaft and an air bearing, wherein the air bearing includes a cylindrical rotary member connected to the rotary shaft, and a cylindrical fixed surface covering the fixed surface, the method comprising the step of:

selecting materials for the rotary member and the fixed surface are selected so that the material of the rotary member has a coefficient of thermal expansion that is smaller than that of the material of the fixed surface; and

assembling the rotary member and the fixed surface so that the fixed surface surrounds the rotary member and the fixed surface is spaced from the rotary member by a predetermined distance.

REMARKS

Favorable reconsideration is respectfully requested in light of the above amendments and the following comments. Claims 1 and 9 have been amended herein for clarity, and new claim 28 has been added. No new matter has been added.

Applicants note that an Information Disclosure Statement was filed in this application on February 25, 2002 and was, in fact, received by the Patent Office on March 6, 2002 (by virtue of return postcard). An initialed copy of the PTO form 1449 included with that Information Disclosure Statement has not yet been returned to Applicants. Thus, Applicants respectfully request that the art cited in said submission be considered and a properly initialed 1449 be returned with the next communication from the Patent Office.

Prior to addressing the individual rejections, Applicants note that the Examiner cites a particular website as providing thermal conductivity data. Unfortunately, this website does not presently appear to be available. If the Examiner persists on relying on this reference, a copy thereof is respectfully requested, as well as information pertaining to the effective date of such a reference.

Applicants respectfully traverse the Examiner's rejection of claims 1-7 and 9-11 under 35 U.S.C. § 103(a) as unpatentable over Konno et al., U.S. Patent No. 5,089,732, in view of Weilbach et al., U.S. Patent No. 5,019,738. The claimed invention (see claim 1) describes a motor having a rotary member that is formed of a material having a lower coefficient of thermal expansion than that of a corresponding sleeve or that is formed (see claim 9) of a material having a particular upper limit on its coefficient of thermal expansion.

As described, for example, at page 14 of the instant specification, the sleeve is air cooled during use while the rotary member is not, resulting in a greater temperature increase for the rotary member in comparison with the sleeve. By providing the rotary member formed from a material having a low coefficient of thermal expansion, the relative rates of thermal expansion of the rotary member can be made to approximate that of the sleeve. As a result, the gap between the outer surface of the rotary member and the inner surface of the sleeve can remain relatively constant.

The Examiner correctly notes that Konno et al. fail to describe or suggest employing a rotary member that has a coefficient of thermal expansion that is less than the coefficient of

thermal expansion of a corresponding sleeve in which the rotary member resides. Weilbach et al. is relied upon to suggest the use of such a rotary member.

Table 1 of Weilbach et al. disclose a number of combinations of rotary member and sleeve materials. Some combinations represent a rotary member having a coefficient of thermal expansion that is less than that of the corresponding sleeve material. Other combinations represent a rotary member that has a coefficient of thermal expansion that is greater than that of the corresponding sleeve material. Thus, the Examiner is correct in noting that Weilbach et al. do disclose combinations in which the rotary member has a coefficient of thermal expansion that is less than that of the corresponding sleeve material.

However, Weilbach et al. appear to describe each of these permutations as providing "successful bearing surfaces". This means that the thermal expansion coefficients of the sleeve and the rotary member are not essential to the Weilbach patent. In other words, Weilbach et al. do not teach selecting the materials of the rotary member and the fixed surface so that the material of the rotary member has a coefficient of thermal expansion that is smaller than that of the material of the fixed surface. With respect to claim 9, Weilbach et al. provide no particular motivation to one of skill in the art to select a rotary member having a particular upper limit on its coefficient of thermal expansion. Weilbach et al. simply do not suggest the claimed invention.

Obviously, while Weilbach et al. profess a preference for providing a rotary member and a corresponding sleeve with matching coefficients of thermal expansion, the reference recognizes no particular advantage for matching a lower thermally expanding rotary member with a greater thermally expanding sleeve. The reference recognizes no particular advantage to selecting a rotary member with a low rate of thermal expansion. Absent reconstructive hindsight, Weilbach et al. is utterly silent as to teaching such a combination.

Therefore, Weilbach et al. fail to remedy the noted shortcomings of Konno et al. and the rejection should be withdrawn. Moreover, there does not appear to be any motivation to combine these references as suggested to attain the claimed invention.

The present invention is directed to a turbo-molecular pump and a motor for the turbo-molecular pump. Since the motor rotates at high speed and is disposed in a relatively high

temperature condition, the temperature change effects such as heat expansion are relatively large. Therefore, it has been found by Applicants that such effects should be carefully considered.

In contrast, Weilbach et al. describe a bearing for a rotating polygon mirror scanner, and Konno et al. describe a spindle motor. Therefore, there is no need to consider temperature effects. Neither Weilbach et al. nor Konno et al. teach that the bearing or the motor is applicable to a turbo-molecular pump. Accordingly, there is no motivation to combine Weilbach et al. and Konno et al. to reach a turbo-molecular pump or a motor for a turbo-molecular pump. Indeed, the suggested combination fails to disclose a turbo-molecular pump or a motor therefore and thus, the rejection is improper.

Favorable reconsideration is respectfully requested.

Applicants respectfully traverse the Examiner's rejection of claims 8 and 12 under 35 U.S.C. § 103(a) as unpatentable over Konno et al., U.S. Patent No. 5,089,732, in view of Weilbach et al., U.S. Patent No. 5,019,738, and further in view of Conrad, U.S. Patent No. 5,707,213. Konno et al. and Weilbach et al. are distinguished as above.

Conrad is relied upon to suggest inclusion of a case that accommodates the bearing, rotary member and fixed surface and that is slit to facilitate cooling. However, Conrad fails to describe or suggest selecting a rotary member having a coefficient of thermal expansion that is less than that of a corresponding sleeve and thus fails to remedy the noted shortcomings of Konno et al. and Weilbach et al. Favorable reconsideration is respectfully requested.

Applicants respectfully traverse the Examiner's rejection of claims 13-16 under 35 U.S.C. § 103(a) as unpatentable over Konno et al., U.S. Patent No. 5,089,732, in view of Weilbach et al., U.S. Patent No. 5,019,738, and further in view of Yashiro, JP 2-16389. Konno et al. and Weilbach et al. are distinguished as above.

Yashiro is relied upon to suggest the use of a cylindrical ceramic bearing having a low coefficient of thermal expansion. However, the disclosure of a ceramic bearing having a particular coefficient of thermal expansion does not in itself describe or suggest combining a rotary member having a lower coefficient of thermal expansion with a sleeve having a higher coefficient of thermal expansion. Thus, Yashiro fails to remedy the noted shortcomings of Konno et al. and Weilbach et al.

With respect to claim 15, Yashiro does disclose the use of ceramic in a bearing. Some ceramics can have coefficients of thermal expansion that meet the claimed limitation. However, Yashiro does not appear to specifically point to such a ceramic or provide any particular reason for selecting a rotary member having a low coefficient of thermal expansion. Thus, Yashiro provides no motivation to one of skill in the art to form a rotary member from a material having the claimed thermal expansion property.

Favorable reconsideration is respectfully requested.

CONCLUSION

In view of the amendments and comments presented herein, claims 1-16 and 28 are now in condition for allowance, and favorable reconsideration in the form of a Notice of Allowance is respectfully requested. If a telephone conference might be of assistance, the Examiner is invited to contact the undersigned attorney at (612) 677-9050.

Respectfully submitted,

Hirokazu Yashiro et al.

By their attorney,

Date: 8/30/02

David M. Crompton, Reg. No. 36,772
CROMPTON, SEAGER & TUFTE, LLC
331 Second Avenue South, Suite 895
Minneapolis, Minnesota 55401-2246
Telephone: (612) 677-9050
Facsimile: (612) 359-9349